

## **The San Jacinto Marsh Project, Restoration of a Priceless Biological and Cultural Resource**

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The author received undergraduate and graduate degrees in Wildlife Science from Texas A&M University, and managed several museums and historic sites in central Texas and on the coast prior to joining the Natural Resource Program at Texas Parks and Wildlife. For the past six years, he has been the Program's Resource Coordinator responsible for protection and management of natural and cultural resources in State Parks along the gulf coast. In addition to drafting Management Plans for park lands and monitoring impacts associated with park development and operations, he has been Project Manager for wetland restoration projects at San Jacinto Battleground and Galveston Island State Park since 1994.

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Restoration of a Priceless Biological and Cultural Resource**

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San Jacinto Battleground State Historical Park is the oldest and most-visited park in the Texas State Park system. It preserves the battleground, where, on April 21, 1836, a volunteer army under Sam Houston routed and defeated a numerically superior force of professional soldiers under General Antonio Lopez de Santa Anna, making Texas an independent republic. The park consists of roughly a thousand acres, including three hundred acres of San Jacinto River floodplain. It appears that this low bottomland, created by the meandering river, was once a fairly homogenous salt meadow of about four hundred acres, tidally connected to the river through Santa Annas Bayou. Due to a combination of subsidence, erosion, and dredge disposal, the remaining acreage consists of a mosaic of shallow open water, vegetated and unvegetated tidal flats, salt marsh, forested uplands and isolated wetlands.

In 1993, Texas Parks and Wildlife began evaluating the natural resources within the park, and became concerned about both the loss of land due to erosion, and the loss of biological values due to drowning of the salt marsh. Although this assemblage of habitats was home to a respectable diversity of wildlife, two hundred acres consisted of knee-deep open water which was of low productivity, due to extreme temperature and dissolved-oxygen fluctuations. In addition, the open water complicated interpretation of the Battle of San Jacinto, in which hundreds of Mexican soldiers fled into the marsh north of the battleground where they bogged down and were picked off from the bluff above. Visitors trying to visualize the battle were regularly confused seeing open water where maps and historical accounts portrayed grassy marshes.

After consulting with biologists in state and federal agencies and the private sector, a plan took shape for replacing the lost biological values and restoring the appearance of the marsh to the time of the battle by converting the two-hundred acres of shallow open water back to salt marsh and salt meadow.

Dredge containment levees constructed in the early 1950's allowed the marsh to be divided into two (2) one hundred-acre cells to facilitate the hydraulic placement of new sediment. The goal was to beneficially use dredged sediment to refill the two cells to intertidal elevations which would support smooth cordgrass (*Spartina alterniflora*). Using bathymetric surveys tied only to healthy stands of smooth cordgrass inside the existing marsh, the volume of sediment needed was calculated to be 385,000 cubic yards in the upstream cell, "cell I", and a little over 400,000 cubic yards in cell II.

To ensure the use of sediment which would be suitable for supporting marsh organisms, a group of reviewers was formed with representatives from TNRCC, TPWD and USFWS. It was decided that acute biotoxicity testing would be used to evaluate sediment. In 1996, the first sediments, from the Houston Ship Channel (HSC) between Greens and Carpenters Bayou, were tested. They were toxic

to most of the marine organisms to which they were exposed and the decision was made not to use this material. The next opportunity came in 1997, when the Corps of Engineers began planning for maintenance dredging of the reach of the HSC from Carpenters Bayou to Morgan's Point. These sediments, being downstream of the confluence of Buffalo Bayou and the San Jacinto River, were coarser and better washed. They were not toxic to marine organisms to which they were exposed, and the decision was made to use them in the project, along with sediment from an intake canal of Houston Lighting and Power, located just downstream from the park, which had also been evaluated for contaminants and found to be acceptable.

Funds to improve containment levees and install water control structures came from USFWS and from the state and federal trustees administering the Natural Resource Damage Assessment program, allocating funds from the Apex Barge Spill in Galveston Bay. They included representatives from TPWD, TNRCC, GLO, DOI and NMFS. Additional funding and in-kind contributions came from Texaco Exploration and Production Inc., TxDOT, the Port of Houston Authority, and the Harris County Adult Probation Program. Approximately 390,000 cubic yards of sediment were loaded into cell I in February - April, 1998. Samples were taken to calculate final de-watering coefficients and datums were established to track sediment shrinkage. Around cell I, sediments were expected to shrink to from one-half to one-third their original placement volume. In May, a few pounds of smooth cordgrass seed were thrown out to test germination and growth.

The new sediment was monitored regularly, and half of the predicted shrinkage had occurred by late-summer. Since then, high tides and rain storms have kept the sediment wet and slowed the rate of de-watering. At the same time, much of cell I is now tidal, and a topography including pools and shallow channels has developed, suggesting that elevations for tidal marsh restoration are close to optimum. Of the seed broadcast in May, that which survived the early-summer drought produced dense stands of cordgrass, further suggesting that hydrology and nutrient regimes are appropriate for the new marsh.

During the summer, the San Jacinto marshes experienced a dramatic burst of wildlife, with numbers of shore and wading birds exceeding any previously observed. On some days, thousands of birds were seen, including dozens of wood ibises and roseate spoonbills, and hundreds of egrets, cormorants, pelicans, terns, gulls, mottled ducks and shore birds. This amazing diversity and productivity is believed to have resulted from nutrients released from the new sediment in cell I, which resulted in an explosion of algae, microorganisms and insects, which attracted fry, minnows and bait fish, which in turn attracted game fish and birds. It will be interesting to see how utilization of the marsh in future years will compare to this past year.

Future plans for the project call for continuing re-vegetation, monitoring and documentation of cell I and restoration of cell II. As a result of the success of seeding with smooth cordgrass in 1998, an expanded program of seeding will take place in early Spring, 1999, with all suitable areas of cell I being seeded. Monitoring will include evaluation of vegetation cover from aerial photographs and subjective assessment of bird and other wildlife use. At some point, a section of containment levee between the two cells will be removed to promote better tidal exchange in cell I.

Estimates are that a fifth of cell I will end up at sub-tidal elevations, so sediment will be added to

both cells as suitable material is made available. With conventional disposal sites charging three dollars or more per cubic yard for disposal, San Jacinto becomes an attractive disposal option for dredging operations within a mile or two of the park. Placement requirements in the marsh are more stringent than at other sites, but the savings have more than offset costs for the two donors of dredged sediment to-date. Staff involved in the project may also consider a combination of hydraulic placement and "terrace field" construction for marsh restoration in cell II.

The project at San Jacinto Battleground is an exciting project which has begun the process of restoring both biological and cultural values to the marsh which played such an important role in that decisive victory of April, 1836. The project highlights what can be accomplished when federal, state and private interests come together to preserve a unique resource. Thanks to the success of the marsh project, plans are already in the making for restoration and enhancement of hundreds of acres of coastal tallgrass prairie and bottomland hardwood forest at San Jacinto. In addition, efforts are underway to raise funds for the construction of a boardwalk trail, observation deck and exhibits that will take visitors into the marsh for a first-hand look at this priceless biological and cultural resource.